**Enthalpy change calculations**

**1.** Calculate the Δf*H* ° for B2H6(*g*), given the following data:

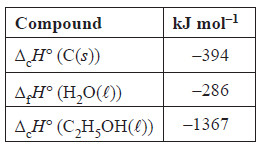
Δf *H* ° (B2O3(*s*)) = −1255 kJ mol–1

Δf *H* ° (H2O(l)) = −286 kJ mol–1

B2H6(*g*) + 3O2(*g*) → B2O3(*s*) + 3H2O(l) Δr *H* ° = −2148 kJ mol–1

The melting point of boron is 2300°C.

**2.** (**i)**



Calculate the standard enthalpy of formation of liquid ethanol using the information given above.

**ii)** Discuss how the value of the enthalpy change would differ if the ethanol product formed was a gas rather

than a liquid. *No calculation is necessary.*

**3.** When gaseous hydrogen and oxygen are heated in a test tube, droplets of liquid water form on the sides of

the test tube.

Calculate Δf *H°* (H2O(*ℓ*)), given the following data:

Δf *H°* (H2O(*g*)) = – 242 kJ mol–1

Δvap *H°* (H2O(*ℓ*)) = + 44 kJ mol–1

**4. (i)** Ammonia can be oxidised to produce nitrogen, N2, and steam as shown in the equation below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4NH3(*g*) | + | 3O2(*g*) | 🡪 | 2N2(*g*) | + | 6H2O(*g*) |  | = –1267 kJ mol–1 |

Calculate the energy produced when 50.0 g of ammonia reacts as shown in the equation above.

**5.** f*H* (HBr, *g*) is –36.2 kJ mol–1. Calculate the heat produced by the formation of 50.0 g of HBr(*g*) from its elements in their standard states.

**6.** The experimental value for f*H*(H2O, *ℓ*) is –286 kJ mol–1 and the enthalpy of formation of water in

the **gas** state, f*H* **(H2O, *g*) is –241 kJ mol–1

Using the information, calculate the vap*H*(H2O), and also the heat required to vaporise 100 g of water.

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